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ABSTRACT: Wave propagation in discontinuous media, which is of interest for design analysis of underground structures and geotechnical works in general, is studied in this paper with the scattering matrix method. This method determines the response of a system, i.e. the discontinuous medium, excited by an elastic wave. Both P, SV or SH waves can be applied to the model with any oblique angle of incidence. The scattering matrix is composed of reflection and transmission coefficients of a single joint or a set of parallel joints. The analytical solution is obtained in the frequency domain and allows one to consider multiple wave reflections between joints. Reflected and transmitted waves are calculated for one and more joints in dry or fluid filled conditions. The solutions obtained are compared with analytical and numerical solutions available in the literature or obtained independently by using the Distinct Element Method.